

Hermaphroditic Skipjack¹

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TWO PAIRS of skipjack (*Katsuwonus pelamis*) gonads, each having male and female components, have come to my attention in the past 3 years. The first was received from Mr. Thomas S. Higa, proprietor of a Honolulu fish retail market, in April 1957. Mr. Higa recovered the gonads from a neighboring fish retailer who had discovered them in a freshly eviscerated 16-lb. skipjack. This fish was captured by the "Orion," a commercial skipjack vessel, on April 11, 1957, off Makua, Oahu, from a school of 15- to 18-lb. skipjack.

The ovo-testes (Fig. 1) were typically paired and elongate, joined posteriorly, and weighed 121 gm. (fresh weight). The male and female components were easily discernible. The left gonad was divided into three segments; the anterior one-sixth and posterior one-third were ovarian and the remainder testicular. The right gonad was divided into two segments; about two-thirds of the anterior portion was testicular and the remainder ovarian. Figure 2 shows the length of each of these segments.

The cream-colored testicular sections were solid and somewhat flattened in cross-section, and did not seem to be atypical in any way. There was no running milt present, but their size suggested that they were in a rather advanced stage of maturity. All ovarian sections were pinkish, but differed in firmness. The posterior segments were hollow and flabby, with a ribbed internal cavity extending their entire length. The single anterior ovarian section was nearly round in cross-section and rather turgid.

Detailed examination of the ovo-testes was made after they had been preserved in 10 per cent formalin. The longitudinal duct of each

testicular section could be followed posteriorly to the juncture of the testicular and ovarian segments, after which the ductus deferens became obscured in the network of blood vessels on the surface of the ovarian section. No openings of the ductus deferens were detected anywhere in the area of the urogenital sinus.

The two posterior ovarian sections were joined posteriorly by a single oviduct which opened into the urogenital orifice. No duct could be found in the single anterior ovarian segment.

Microscopic examination of the ova was made to determine their degree of maturity. The lumen of the anterior ovarian section was filled

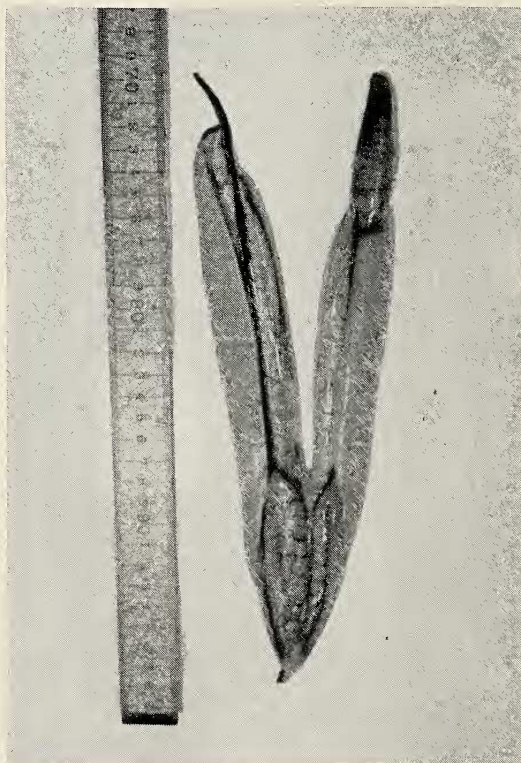


FIG. 1. The ovo-testes of a hermaphroditic skipjack (ventral view).

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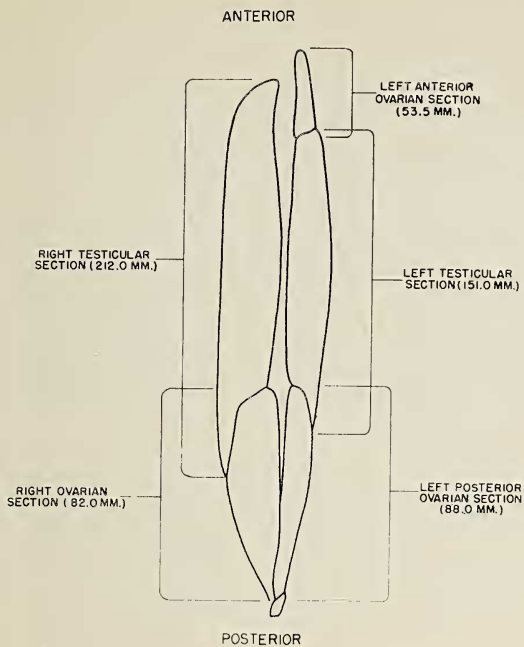


FIG. 2. Outline of the ovo-testes, showing the location and size of the male and female components (ventral view).

with a compact mass of resorbing ova, while the peripheral portion contained ova ranging from small, transparent stages to larger, opaque ova. The average diameter of 25 randomly selected larger, opaque ova was 0.504 mm. The posterior ovarian sections contained similar small and large ova, but no resorbing ova were present. Average diameters of randomly selected ova from these parts were 0.543 mm. for the left posterior member and 0.514 mm. for the right.

The presence of residual ova in the anterior section suggests that the fish had been a functional female. Assuming that the ova in each of the ovarian sections ripened at the same time, it is possible that ova were extruded from the posterior sections at spawning time, whereas ova in the anterior section could not be extruded because of the lack of an adequate duct. This could account for the presence of the resorbing ova in the lumen of the anterior ovarian section. Since the testicular sections were well developed and constituted a large part of the gonads, the fish may also have been a functional male.

The discovery of the second pair of ovo-testes was reported to the Honolulu Biological Laboratory on March 10, 1960, by Mr. Richard Nakashima of Honolulu, who found them in a 10-lb. skipjack.

The gonads, outlined in Figure 3 and labeled *A* and *B* for purpose of identification, were not joined posteriorly as a result of mutilation to both posterior ends during removal, and, therefore, could not be identified as to position (left or right). Both gonads were distinctly separated into three parts; an anterior ovarian section, a middle testicular portion, and a torn, fragmentary ovarian segment posteriorly. The testicular segments were similar to those found in the ovo-testes previously described, and contained no running milt. The ovarian sections were predominantly yellow with a tinge of pink. The anterior segments were flabby and hollow.

A starch suspension colored with powdered carmine was injected into the posterior ovarian section of gonad *A* and the flow of injected material indicated the presence of a duct connecting the two ovarian parts. A similar injection was attempted with gonad *B*, but failed

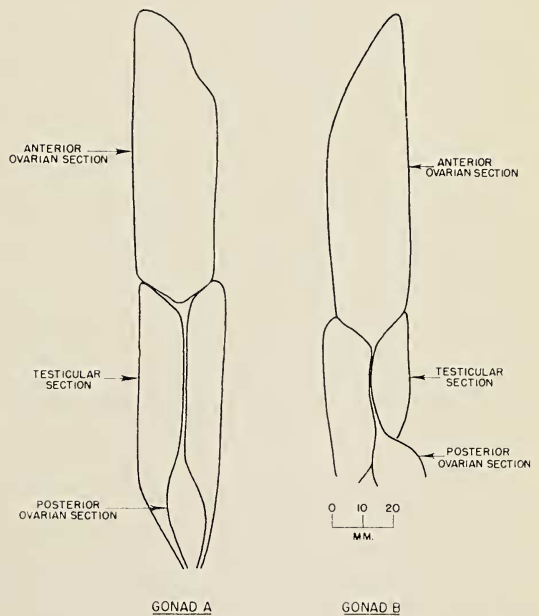


FIG. 3. Outline of the ovo-testes, showing the location and relative size of the male and female components.

to reveal any ducts owing to excessive tissue damage.

Ova diameter measurements revealed that the posterior ovarian section of gonad *A* and both ovarian segments of gonad *B* were identical in their degree of development. The ova ranged from small, primitive ova to larger, opaque ova. Average diameters of 25 randomly selected ova of the most advanced group were 0.479 mm. for the posterior ovarian section of gonad *A* and 0.476 mm. and 0.479 mm. for the anterior and posterior ovarian sections, respectively, of gonad *B*.

The development of the anterior ovarian section of gonad *A* was dissimilar to any of the sections previously examined. Its lumen contained a loose mass of large, ripe, resorbing ova, together with a few completely degenerated ova. The peripheral portion of the section contained only primitive ova. Those intermediate

to the primitive and the large, resorbing ova were absent.

The presence of residual ova indicates that this fish also had been a functional female. Again, it is not clear whether the ova remnants were the unexpelled portions of a previous successful spawning or a group of ripe ova that were not expelled owing to the inadequacy of the duct. Damage to the posterior portions of both gonads made it impossible to determine whether the male ducts were connected to the exterior, but since the testicular segments were well developed, this fish may also have been a functional male.

Hermaphroditism in skipjack is an extremely rare occurrence. So far as is known, only one other example has been recorded and described (Nakamura, H., 1935, *Trans. Nat. Hist. Soc. Formosa* 25(141): 197-198; in Japanese).